these species are undoubtedly derived from the surface of the ripe fruit, their germs are extremely rare, though capable of rapid multiplication when once introduced into the must. W. TRELEASE.

THE VARIATION OF TEMPERATURE IN GERMANY.[1]

DR. HELLMANN has, by this paper, added another to the already large list of climatological contributions which have appeared in the German language. Such papers can and ought to serve as models for the uses to which the data secured in our own country should be put; and although we may have no particular interest in the climatical relations which exist in a certain part of Europe, yet each paper of the nature of the present should be carefully examined as to method, if not for results.

In 1874 there was given in this same publication an article on the climatology of Germany; and this contained the mean temperature for the twenty-five years from 1848 to 1872 of the stations connected with the Prussian meteorological institute. Hellmann has made a new discussion of these temperatures, and has included in this the ten years extending from 1872 to 1882. He has chosen to put the observations into five-day periods; and, using these means in his discussion, he proceeds, by means of combining certain stations, to show what deductions he can draw from the material at his disposal. The twenty-five stations he divides into seven districts, which have recognizably different meteorological conditions; and these stations are quite evenly distributed. Of the twenty-five, only ten were complete in their meteorological data; but the lacking observations have been filled in, and the error of this reduction will not exceed 0.2° C. Hellmann then proceeds to give the missing dates for the various stations. The observations were made at six, two, and ten, with one exception; and he deplores the fact that the lack of good hourly observations does not allow the reduction of these to a true daily mean. The temperatures for the various places are plotted, and curves drawn, on the same page, so that they can be easily compared with each other; and the curves are, in general, similar. The author brings out the fact that "unperiodic weather characteristics are not of a local nature, but occur at the same time over large areas." He also shows that the yearly extremes increase as we proceed inland. With three exceptions, the coldest weather occurred in the five days between Jan. 11 and Jan. 15, but the warmest weather does not occur in all at the same time: this varies from July 17 to July 27. Hellmann goes into a detailed discussion of this difference and the reason. He remarks that Wargentin, in 1760, was the first to use the mean temperature for five-day periods in showing the yearly rate. The temperature-curves of Breslau for ninety-two years and for thirty-five years are compared. An interesting table is given in which the probability is computed that each succeeding five days will be colder from January to August, and warmer from August to January. The periodic return of colder weather is carefully examined and commented on in detail.

At the end of five pages of text we find six pages of tables, containing the five-day means for each of the stations from 1848 to 1882; then comes the graphical representation of this as already mentioned, and next a number of curves showing the relations of the air-pressure, temperature, rain, and probability of succeeding cold at Breslau from 1848 to 1882, and then curves showing the temperature for May and June for Breslau for each year of this same period.

F. W.

[1] *Ueber den jährlichen gang der temperatur in Norddeutschland.* By Dr. G. HELLMANN. From the *Zeitschrift der Königlich preussischen statistischen bureau's, jahrgang* 1883.

LOUIS PASTEUR.

M. Pasteur. Histoire d'un savant, par un ignorant. Paris, *Hetzel*, 1883. 14+392 p. 16°.

IT is the fashion at present to tell the unfinished histories of living men. Noteworthy literary characters have been of late studied, weighed, almost vivisected; and now science pauses to listen to the life-history of one of her living masters. Let us be thankful, however, that we are not yet asked to take the measure of our friend before his death. On the contrary, we are only invited to draw our chairs about the fireside, while a mutual friend discourses to us, half aloud, and half in confidence, about the man and the scholar, Louis Pasteur.

The book whose title stands above has caused much comment on the continent and in England; so much, indeed, that an English translation is already announced, for which, rumor has it, we are indebted to Professor Tyndall, always a warm admirer of Pasteur. Some of the Parisian correspondents of journals published elsewhere have apparently been much impressed by the book, and have written elaborate reviews of it.

The author of this little history modestly professes to be '*un ignorant*,' whose only merit is that he appreciates the master. On laying down the book, we cannot believe that he really deserves his chosen title, for he has certainly mastered the master himself. However, we shall not quarrel with him, especially since he is now known to be the son-in-law of Pasteur, but shall rather thank him for the labor of love and enthusiasm which he has done so well. As has been hinted above, the author has given a familiar account of the life and labors of Pasteur. The book is not a 'critical examination:' it is, rather, a fascinating story. Of course, from the rigid scientific stand-point, it is one-sided and partial. Objectors and ob-

jections are seldom adequately recognized and met. Liebig gets fuller treatment than most; while Schützenberger, Koch, and Berthelot are either passed with a light touch or altogether ignored. Much of the story gives the impression of a comparatively quiet and always triumphant life, flowing smoothly on, — a stream of brilliant scientific conquest, unrippled by blunders, and unchallenged by the incredulous. But the initiated know that the course of true science, like that of true love, never runs smooth, though both are probably all the more interesting on that account.

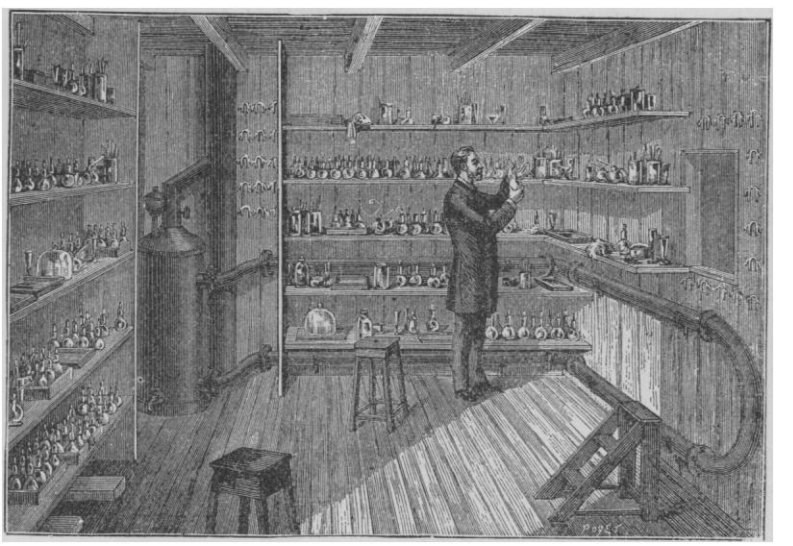
Louis Pasteur was born in Dôle, Dec. 27, 1822. His father, who had been an honorable soldier, had settled down as a tanner, but he appears to have had an earnest desire that his boy Louis should become a scholar. "Ah!" said the father over and over again to the young boy, "if you could only become a professor some day, and a professor in the college of Arbois, I should be the happiest man in the world." Little did the father think that his son would be professor — not at the humble Arbois, but in the École normale de Paris.

In 1842 young Pasteur was examined for entrance to the École normale. He was admitted, but stood fourteenth; whereupon he voluntarily spent a year in more careful preparation, and then, in 1843, entered the École, now standing fourth among the candidates.

Chemistry had already become a passion with him; and under Dumas at the Sorbonne, and Balard at the École, he had ample opportunity for following his bent: "M. Dumas, with his serene gravity, . . . never letting the least inaccuracy slip into his words or his experiments; M. Balard, with boyish vivacity, . . . not always giving his words time to follow his thoughts."

Under Delafosse, Pasteur now became absorbed in molecular physics, and finally met with an anomaly pointed out by Mitscherlich; viz., that while the tartrates and paratartrates of sodium and ammonium are in nearly all respects alike, they yet act differently upon polarized light. This anomaly fastened itself in the fresh mind of Pasteur, and eventually led him to his views on dissymmetry, which are here given at great length.

While still absorbed in molecular physics, Pasteur was appointed assistant professor at Strasbourg, where he carried on the same studies. "To interrupt these required nothing less than his marriage with Mlle. Marie Laurent, the daughter of the rector of the academy. Indeed, it is said, that, on the morning of the wedding-day, some one had to go to the laboratory to remind M. Pasteur that it was the day on which he was to be married." The author assures us, however, that he has proved to be so good a husband, that Madame Pasteur listens to the story now with an indulgent smile.

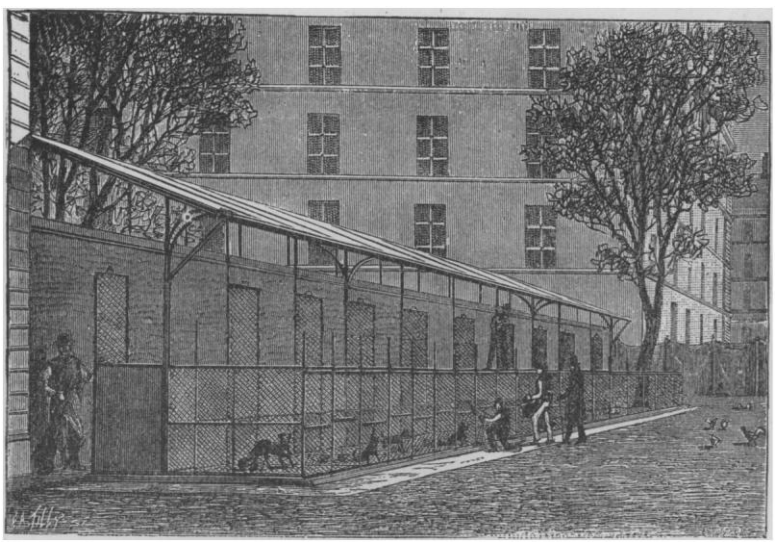


THE WARM ROOM FOR THE CULTURE OF MICROBES.

In 1854 Pasteur was appointed dean of the faculty of sciences at Lille. He was then thirty-two years of age, and almost wildly enthusiastic over molecular physics. But as a matter of policy, for the sake of drawing the attention of the neighborhood to the new faculty, he resolved to lecture, for at least a part of every session, upon fermentation, because the making of alcohol was a prominent industry thereabouts.

From this time on, Pasteur's history is more familiar. Fermentations, spontaneous generation, wine, vinegar, the silk-worm disease, splenic-fever, chicken-cholera, hydrophobia, and vaccination have been successively studied by him, and many of them much elucidated.

In the present volume their history is given in very interesting detail, which, however, time does not permit us to consider. By no means all of his views are accepted or acceptable; but in the distinguished professor — now of the



KENNELS FOR MAD DOGS.

École normale, and Membre de l'Institut — we have a very brilliant example of a man of science who has finally attained great and deserved fame. If its coming was slow, it was sure; and scientific men have often had to wait for '*le grand public.*'

The last chapter of the book describes the biological laboratory of the École normale. Under Pasteur's control, its funds have been made ample by the liberality both of the government and of the municipal council of Paris. The garden of the old Collége Rollin has been placed at his disposal; and here Pasteur has provided stables for horses having the glanders, sheep-pens for sheep attacked by splenic-fever, and kennels for dogs mad with rabies. In the cellars beneath his laboratory in the Rue d'Ulm dwells a shifting population, a sort of unhappy family of animals undergoing experiment. The author dryly remarks, that the mad dogs are not particularly re-assuring to the spectator, as they furiously bite the iron bars of their cages. While some, however, are furious, and given to lugubrious barking, others are still unconscious of the fatal germ that is developing within them. Here are families of fowls, rabbits, guinea-pigs, and little white mice, all destined for inoculation experiments. Every morning a tour of inspection is made, and the dead are removed to the rooms above for dissection and examination. Some of the animals are also brought up from time to time for vivisection. But in Pasteur's laboratory 'every vivisected dog is a chloroformed dog.' He states very emphatically, however, that, though he "would never have the courage to kill a bird for sport, in the cause of science he has no scruples." Distributed about the laboratory and offices are panniers and boxes, some of great size, wrapped in straw, and containing the carcasses of animals (sent from all parts of France, and, indeed, of the world) which have died of various diseases. In fact, there seems to be a regular delivery at the laboratory, not only of these Christmas-like hampers, but of small tin boxes and carefully packed phials, containing such precious gifts, by foreign *savants*, as yellow-fever secretions from Brazil, or possibly cholera-germs from

CAGE FOR A MAD DOG.

India. Perhaps the most curious sight is the large number of glass tubes distributed everywhere through the laboratory. In the solutions contained in the tubes, swarm millions and mil-

lions of microbes in various stages of 'attenuation;' and a prick from a pin-point dipped in any one of them might confer a horrible disease or future immunity from it. Yet in the midst of such dread possibilities the devoted experimentalist moves unharmed.

The closing paragraph runs as follows: "At this very moment experiments [upon the prevention of hydrophobia] are under full headway. Biting dogs and bitten dogs fill the laboratory. Without reckoning the hundreds of dogs which within three years have died mad in the laboratory, there is not a case discovered in Paris of which Pasteur is not notified. 'A poodle and a bull-dog [*bouledogue*] in the height of an attack; come!' was a telegram sent to him recently." Pasteur went, and took our author with him. The two dogs were rabid '*au dernier point*,' and it was only after some time and no small trouble that they were bound securely to a table. M. Pasteur then bent over the frothing head of the bull-dog, and sucked into a pipette a few drops of saliva. Our author remarks, in conclusion, that Pasteur never appeared to him so great as in the cellar where this took place, and while this '*tête-à-tête formidable*' was being enacted.

PLANTÉ'S RESEARCHES.

Recherches sur l'électricité, de 1859 à 1879. Par GASTON PLANTÉ. Paris, *La lumière électrique*, 1883. 5+322 p. 8°.

THE great interest taken in electric accumulators since Faure brought out his secondary battery, in 1881, has doubtless led to this reprint of Planté's researches from the text of the first edition, published in 1879, and two supplementary papers issued a few months later. These researches, extending over a period of twenty years, are characterized by a neatness and originality that make them very attractive. The writer considered himself specially fortunate in receiving a cordial invitation from M. Planté, in 1881, to witness many of the most interesting experiments described in this book. A review of them recalls vividly the pleasure experienced in Planté's laboratory, near the celebrated 'Place de la Bastille.'

A *diplôme d'honneur* was most worthily conferred on M. Planté at the Paris exposition of electricity, in recognition of his labors as the inventor of the secondary battery; for, while polarization currents had been observed by other physicists previous to the beginning of his work in 1859, no one had pursued the investigation with sufficient patience to make the principle of any special value. It is entirely safe to say now, however, — in view, too, of all that inventors have done within the past three years, — that no one can make a special study of secondary batteries, or succeed in making efficient ones, without going to these researches of Planté for the most essential part of his information. As a purely experimental series, they must take rank with the best in the domain of physics.

It is to be regretted that M. Planté has not revised those portions of his researches relating to the chemical reactions taking place during the charging of the cell and its discharge. His explanation of the formation of the peroxide of lead on one plate, and of spongy lead on the other, has the merit of simplicity at least; but, in the light of Gladstone and Tribe's[1] investigations, it must be considered as entirely too simple to accord with the facts. No mention is made, in these researches, of the formation of lead sulphate; and yet its presence is fully established, and the part it plays in local action is clearly demonstrated. The slow conversion of the peroxide into sulphate on the negative plate, with the circuit open, explains the gradual fall of electromotive force; while the residual charge appears to be fully accounted for by the two related facts of the formation of a small amount of peroxide on the positive plate during the discharge, producing electrical equilibrium before the peroxide on the negative plate is exhausted, and the subsequent conversion of this peroxide into sulphate, thus re-establishing a difference of potential. The formation of highly resistant sulphate from peroxide on the negative plate, and from metallic lead on the positive, accounts for Planté's observation that a cell long disused acquires great internal resistance, and charges again with difficulty. It seems highly probable, however, that the skill acquired by Planté in 'forming' his cells enables him to so modify the physical character of the surfaces of the lead plates that the sulphate plays a less important part in the final chemical action in his cell than it does in the experiments of less skilled physicists. Thus Professor Barker says of one of his Planté cells, "Not a trace of sulphate has been formed in it apparently, though it has been in use for six months."[2]

It would be pleasant to express as high an opinion of M. Planté's explanations of electrical phenomena in nature as of his researches: but this is impossible; for while he gives a possible explanation of ball-lightning, and other

[1] *Nature*, xxv. 221, 461; xxvi. 251, 602.
[2] *Proc. Amer. assoc.*, xxxi. 217.